

AMORPHOUS ALUMINUM OXIDE COATING ON POLYCARBONATE
SUBSTRATES USING RF MAGNETRON SPUTTER DEPOSITION

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Coating industries have shown a great interest in aluminum oxide films as a possible transparent, scratch resistant protective coatings for plastics. For this reason, we have investigated the deposition and as well as the optical and mechanical properties of aluminum oxide films on glass and polycarbonate substrates. Glass substrate was used because polycarbonate substrates show significant optical absorption, making it very difficult to distinguish the film from the substrate in optical testing. Depositions on plastics require low temperatures (~ room temperature) as opposed to the higher deposition temperatures typically used for oxide growth.

In the present research the aluminum oxide films (~ 1 to 2 μm) were prepared by RF magnetron sputter deposition on both glass and polycarbonate substrates during the same run without any additional heating of the substrates. During deposition the Argon pressure was maintained at 3 mTorr, with an Ar flow rate of 41.5 sccm and an O₂ flow rate of 5.7sccm, and using an RF magnetron source (power 900W). X-ray diffraction measurements of the films show that films are amorphous in structure. A diamond stylus thickness profilometer was used to measure the film thickness. The film thickness was found to be ~1.5 μm . Optical (transmission/ reflection) spectroscopy was performed using a UV-Visible (175 nm- 3000 nm) spectrometer. The aluminum oxide film/glass show a high % of transmission and the analysis of the optical data shows that the refractive index ~ 1.5-1.7 (very close to that of Al₂O₃). The results of mechanical tests performed with a nano-indentation system will also be presented.

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